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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT

PAPER NUMBER

1774

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No. 09/747,933	Applicant(s) IGARASHI ET AL.	
Examiner Marie R. Yamnitzky	Art Unit 1774	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 December 2002.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5-7 and 10-17 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 5-7 and 10-17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

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1. This Office action is in response to applicants' amendment filed 12/26/02 (Paper No. 5), which cancels claims 1-4, 8 and 9, amends claims 5 and 6, and adds claims 10-17.

Claims 5-7 and 10-17 are pending.

2. Claims 5-7 and 10-17 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The original disclosure does not provide support for a light-emitting material represented by formula (7) wherein  $Z^{22}$  represents a nonmetallic atom group required to form an imidazole ring, thiazole ring, oxazole ring, pyrrole ring, pyridine ring or pyrimidine ring. These rings are inconsistent with formula (7) in which  $Z^{22}$  forms a ring with two nitrogens, the two nitrogens being at positions 1 and 2 of the ring. Page 27 of the specification discloses these rings for the ring formed by  $Z^{21}$  but not for  $Z^{22}$ .

Support for a light-emitting material of formula (20) as defined in claim 5, with claims 6, 7, 10 and 14-17 dependent therefrom, is not clear because support for the definition of m203 and n203 as set forth in claim 5 for formula (20) is not clear. Based on the definitions of m203 and n203 in claim 5, formula (20) encompasses iridium complexes consisting of iridium and as few as one bidentate ligand or as many as five bidentate ligands.

Support for a light-emitting material of formula (19) as defined in claim 15, with claim 16 dependent therefrom, is not clear because support for the definition of m202 and n202 as set

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forth in claim 15 is not clear. Based on the definitions of m202 and n202 in claim 15, formula (19) encompasses iridium complexes consisting of iridium and as few as one bidentate ligand or as many as seven bidentate ligands.

3. Claims 5-7 and 10-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Lines 6-7 of claim 5 define variables not found in any of formulae (4)-(9) or (20)-(22).

The scope of light emitting materials having a partial structure represented by formula (5) or formula (6) is not clear. With respect to formula (5), it is not clear if "CO" requires a carbonyl group or if "CO" encompasses any group containing a carbon attached to an oxygen. With respect to formula (6), it is not clear if "NC" requires a cyano group or if "NC" encompasses any group containing a nitrogen attached to a carbon. It is not clear if there is any limitation as to how "CO" is joined to "Ir" in formula (5) or "NC" is joined to "Ir" in formula (6). For example, can "CO" or "NC" be part of a substituent on a ligand joined to the iridium?

The scope of light-emitting materials having a partial structure represented by formula (7) is not clear because the definition of  $Z^{22}$  in claims 5 and 10 is inconsistent with the formula. Claim 5 sets forth a formula (7) in which  $Z^{22}$  represents a nonmetallic atom group required to form an imidazole ring, thiazole ring, oxazole ring, pyrrole ring, 1,2,3-triazole ring, 1,2,4-triazole ring, pyridine ring or pyrimidine ring. Claim 10 further limits  $Z^{22}$  of formula (7) to a nonmetallic atom group required to form an imidazole ring, thiazole ring, pyrrole ring, pyridine ring or

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pyrimidine ring. Of these possibilities, a nonmetallic atom group required to form an imidazole ring, thiazole ring, oxazole ring, pyrrole ring, pyridine ring or pyrimidine ring is inconsistent with formula (7) in which  $Z^{22}$  forms a ring with two nitrogens, the two nitrogens being at positions 1 and 2 of the ring. Imidazole and pyrimidine rings contain two nitrogens, the two nitrogens being at positions 1 and 3 of the ring. Thiazole, oxazole, pyrrole and pyridine rings only contain one nitrogen.

The scope of compounds represented by formula (7) is also not clear because it is not clear if  $Z^{21}$  must form a ring containing at least one carbon atom other than the carbon atom shown in the formula and containing at least one nitrogen atom.

Claim 14: There is no antecedent basis for  $L^{202}$  of formula (20). " $L^{202}$ ," should apparently read -- $L^{203}$ --.

Claim 15, with claims 16 and 17 dependent therefrom, is confusing in setting forth formula (19) as representing formula (9). The examiner suggests that it would be more accurate to recite "wherein a material represented by formula (9) is further represented by formula (19)".

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

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5. Claims 5-7 and 10-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Grushin et al. (US 2002/012638 A1).

Grushin et al. disclose iridium compounds suitable for use in the light-emitting layer of an organic electroluminescent device. Grushin et al. disclose iridium compounds meeting the limitations of the light-emitting material required by the present claims. See the whole document, in particular, see paragraphs [0008]-[0021], [0027], [0031]-[0038], [0044]-[0049], [0063]-[0064] and claims 1, 2 and 10-18.

Grushin's compound 1-m, for example, is a compound having a partial structure represented by present formula (8) wherein  $X^{204}$  represents a nitrogen atom, each of  $X^{201}$ ,  $X^{202}$  and  $X^{203}$  represents C-R, and  $Z^{201}$  represents an atomic group for forming an aryl ring.

As another example, Grushin's compound having structure (IV) as shown in paragraph [0049] is a compound having a partial structure represented by present formula (21).

Broadly interpreting present formula (5) as encompassing any iridium compound having a group comprising a carbon attached to an oxygen, Grushin's compounds 1-i, 1-l, 1-q and 1-r, and the compounds having structures (IV), (V), (VI) and (IX) are examples of compounds meeting the limitations of a light-emitting material of formula (5).

Broadly interpreting present formula (6) as encompassing any iridium compound having a group comprising a nitrogen attached to a carbon, each of Grushin's compounds meet the limitations of a light-emitting material having a partial structure represented by formula (6).

6. Claims 5-7 and 10-17 are rejected under 35 U.S.C. 102(e) as being anticipated by Thompson et al. (US 2002/0034656 A1).

Broadly interpreting present formula (5) as encompassing any iridium complex having a group comprising a carbon attached to an oxygen, and broadly interpreting present formula (6) as encompassing any iridium complex having a group comprising a nitrogen attached to a carbon, Thompson et al. disclose various complexes meeting the limitations of a light-emitting material having a partial structure represented by formula (5) or (6). For example, see Fig. 17, 18, 24, 26, 35 and 36. The iridium complexes represented by the formulae shown in these figures, and various other formulae disclosed in the Thompson publication, each contain at least one carbon-nitrogen bond and at least one carbon-oxygen bond.

7. Claims 5-7 and 10-17 are provisionally rejected under 35 U.S.C. 102(e) as being anticipated by copending Application No. 09/695,978 which has an inventor in common with the instant application (but a different inventive entity). Based upon the earlier effective U.S. filing date of the copending application, it would constitute prior art under 35 U.S.C. 102(e), if published under 35 U.S.C. 122(b) or patented. This provisional rejection under 35 U.S.C. 102(e) is based upon a presumption of future publication or patenting of the copending application.

The formula for Compound (f) on page 51 of the copending application represents a compound having a partial structure represented by formula (21) as set forth in claim 5. Broadly interpreting present formula (5) as encompassing any iridium complex having a group comprising a carbon attached to an oxygen, and broadly interpreting present formula (6) as

encompassing any iridium complex having a group comprising a nitrogen attached to a carbon, the formula for Compound (f) also represents a compound having a partial structure represented by formula (5) or (6) as set forth in claim 5.

Example 10 as described on page 56 of the copending application provides an organic light-emitting device comprising a pair of electrodes and, between the pair of electrodes, a layer comprising Compound (f).

This provisional rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the copending application was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131. This rejection may not be overcome by the filing of a terminal disclaimer. See *In re Bartfeld*, 925 F.2d 1450, 17 USPQ2d 1885 (Fed. Cir. 1991).

8. Claims 5-7 and 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thompson et al. (US 2002/0034656 A1) or Grushin et al. (US 2002/0121638 A1).

Thompson et al. and Grushin et al. disclose iridium complexes/compounds for use as light-emitting materials in organic light-emitting devices.

Thompson et al. do not provide a specific example of an iridium complex meeting the limitations of a light-emitting material having a partial structure represented by formula (20) as shown in present claim 5 but such complexes are clearly suggested by Thompson et al. For example, see paragraph [0052] and Fig. 49. The arylquinolines disclosed in Fig. 49 (which were



also disclosed in Thompson's priority application 09/452,346) provide iridium complexes represented by formula (20) wherein m203 is from 1 to 3.

The arylquinolines disclosed in Fig. 49 of the Thompson publication are position isomers of the quinoline derivative ligand of materials represented by formula (9) or (21) as shown in present claim 5, and represented by formula (19) as shown in present claim 15.

Grushin et al. do not provide a specific example of an iridium compound meeting the limitations of a light-emitting material having a partial structure represented by formula (9) or (20) as shown in present claim 5, or represented by formula (19) as shown in present claim 15, but such complexes are clearly suggested by Grushin et al. For example, see paragraphs [0017]-[0021]. A ligand of Grushin's formula (I) wherein R<sup>2</sup> and R<sup>3</sup> join to form a ring such as a six-membered aromatic ring provides an iridium compound represented by formula (9) or (19) wherein Z<sup>201</sup> represents an atomic group for forming an aryl ring. A ligand of Grushin's formula (I) wherein R<sup>1</sup> and R<sup>2</sup> join to form a ring such as a six-membered aromatic ring provides an iridium compound represented by formula (20) wherein Z<sup>201</sup> represents an atomic group for forming an aryl ring.

Further, an arylquinoline ligand according to present formula (9), (19) or (20) is a position isomer of the ligand of formula (III) as shown on the top of page 2 in Grushin's published application.

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the invention to make iridium complexes/compounds having ligands similar to those disclosed

by Thompson et al. or by Grushin et al. with the expectation that such complexes/compounds would also be light-emitting and would be useful in the manufacture of organic light-emitting devices.

9. Applicants cannot rely upon the foreign priority papers to overcome the rejections based on Grushin's published application because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

10. The reference made of record and not relied upon is considered pertinent to applicants' disclosure.

US 2002/0190250 A1 is related to US 2002/0121638 A1 applied above.

11. Patentable subject matter:

The prior art does not disclose or suggest an organic light-emitting device comprising a pair of electrodes and, interposed between the pair of electrodes, at least one layer comprising a light-emitting material having a partial structure represented by:

- formula (4) as defined in present claim 5; or
- formula (7) as shown in present claim 5 wherein  $Z^{21}$  represents a nonmetallic atom group required to form a 5- or 6-membered ring, said ring optionally having a substituent or forming a condensed ring with another ring;  $Y^2$  represents a nitrogen atom or carbon

- atom;  $b^2$  represents a single bond or double bond; and  $Z^{22}$  represents a nonmetallic atom group required to form a 1,2,3-triazole ring, 1,2,4-triazole ring or pyridazine ring; or
- formula (9) as shown in present claim 5 wherein  $Z^{201}$  represents an atomic group for forming a heteroaryl ring and  $Z^{301}$  represents an atomic group for forming an aryl or heteroaryl ring; or
  - formula (10) as shown in original claim 5 wherein  $Z^{201}$  represents an atomic group for forming a heteroaryl ring and  $Z^{401}$  represents an atomic group for forming an aryl or heteroaryl ring; or
  - formula (22) as defined in present claim 5.

12. NOTE: Page 27 of the present specification also discloses a pyrazole ring for  $Z^{22}$  of formula (7). A device comprising a light-emitting material comprising the formula (7) structure in which  $Z^{22}$  forms a pyrazole ring is not patentable because a light-emitting material having a partial structure represented by formula (7) wherein  $Z^{22}$  represents a nonmetallic atom group required to form a pyrazole ring is disclosed in Thompson et al. (US 2002/0034656 A1), with an effective U.S. filing date of 12/01/99 for that subject matter. See Fig. 36 in Thompson's published application.

13. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (703) 308-4413. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

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The current fax numbers for Art Unit 1774 are (703) 872-9311 for official after final faxes and (703) 872-9310 or (703) 305-5408 for all other official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (703) 872-9041.)

MRY  
03/17/03



MARIE YAMNITZKY  
PRIMARY EXAMINER

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